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Lunar project ILOM: Application of the analytical theory of Lunar physical libration for the simulation of star observations

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Abstract

This study briefly describes the targets and problems of the future Japanese project In situ Lunar Orientation Measurement (ILOM), which is planned for the year 2017. One of the important parts of the project is to place a small optical telescope on the Lunar surface with the purpose to detect the Lunar physical libration with unprecedented accuracy 0.001 arcsec. At the present stage of research the computer simulation of future observations is going on, aiming to determine the moments of transition of a star through the first meridian and the polar distance of the star. Rotation of the Moon is being calculated under the analytical theory developed in the frame of a theme of the grant. A list of stars brighter than 12 m, whose coordinates are close to the Lunar precession pole motion, was constructed on the basis of several star catalogues. On average, for each moment of observation in the field of view of the telescope (1) there are approximately 20-25 stars. Analyses of simulated stellar tracks observable from the Lunar surface (in a polar zone) reveal the significant difference from daily parallels of stars in comparison with the Earth. During one Lunar day equal 237 terrestrial days, a star moves on a spiral. However, depending on a longitude of a star, these spirals can be untwisted or twisted. In the latter case a star can describe a loop in the sky of the Moon during the period of supervision. Such an unusual astrometric phenomenon combined with the slow rotation of the Moon is compared with the Earth and the fast precession motion of the Lunar pole (in comparison with the precession motion of a terrestrial pole). © Science China Press and Springer-Verlag Berlin Heidelberg 2012.

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Keywords

ILOM, Lunar, Physical libration, T3elescope